Again, those test-tubes, which his words abhor,
And cheap thermometers with paper zeroes,
All made in Germany before the war,
Were not unknown to many of their heroes.
[Just now sweet girls in improvised pavilions
Are turning English test-tubes out by millions.]

Boys from our "public schools" (including those
Provided, non-provided, and the rest of it),
When once the opportunity arose,
Quitted themselves like men, and made the best of it.
The highest praise for such a band of brothers,
Would be: "Each did his duty like the others."

Then, as to leadership, I knew a lad,
By nature quite unqualified to grapple
With Greek and Latin verses. This was bad.
Worse still, a Jew, he never went to chapel.
And yet he learnt, in spite of missing sermons,
His duty to his men, and to the Germans.

Perhaps the Duke was right in his remark,
That old, apocryphal, and hackneyed saying;
And Eton Playing-fields, and Regent's Park,
And all fair fields where British boys are playing,
Have proved of higher value to the nation
Than classical, or modern, education.

W. D. E.

NOTES.

THERE have been much overlapping and unevenness of distribution in connection with the food parcels sent to British prisoners of war; and little scientific guidance has been sought or given as to the food-values of the things included in the parcels. The first of these defects will be remedied by a scheme which is to be brought into effect on December 1. It is announced that the Central Prisoners of War Committee, recently established by the British Red Cross Society and the Order of St. John, has, with the authority of the Government, now made the necessary arrangements for co-ordinating and controlling the work of the various associations and individuals at present sending parcels to British prisoners of war in Germany and other enemy and neutral countries. These arrangements have been made with the view of securing:—(1) That every prisoner shall receive an adequate supply of the comforts in the form of food, etc.; (2) that the excellent work being done at present by associations and individuals shall be disturbed as little as possible; (3) that overlapping and consequent waste shall be reduced to a minimum. In order to attain these objects the following arrangements have been made:—(1) All parcels must be sent through the Central Committee or an association authorised by it; (2) individual senders are requested not to send food parcels, but to arrange for this to be done by a recognised association. It is hoped that individuals and organisations now collecting funds for prisoners of war will continue their efforts, and will send the money collected either to the Central Committee or to such recognised association as they prefer. Subscriptions and donations should be sent to the Right Hon. Sir Starr Jameson, Bt., C.B., 4 Thurloe Place, London, S.W. All other communications should be addressed to the Secretary, Central Prisoners of War Committee, 4 Thurloe Place, London, S.W. We suggest to the committee that guidance is needed as to the most suitable things to send from the point of view of food-values. A prisoner of war doing moderate work requires a daily ration which has an energy value of 2500 calories, and may be made up of proteins, 100 grams; carbohydrates, 400 grams; and fats, 50 grams. It is possible to combine all these constituents in a single foodstuff, or to see that the ratios are roughly supplied by the combination of several things in a parcel. The British Science Guild has appointed a committee to make suggestions relating to food parcels, and the Central Prisoners of War Committee should enlist its aid or that of other food experts in order to advise associations as to the most suitable constituents of the parcels.

THE Board of Agriculture announces that an estate of 2363 acres near Patrington, in the East Riding of Yorkshire, about fifteen miles distant from Hull, has been acquired under the provisions of the Small Holding Colonies Act, 1916, for the purpose of a land-settlement colony of ex-service men. The soil is a rich alluvium capable of producing very heavy crops. This colony, when fully developed, will consist of a central farm of about 200 acres and sixty small holdings of "mixed farming" type, averaging about 35 acres in extent. The equipment of each of the latter will include a comfortable cottage and the necessary farm buildings for carrying on the holding. The central farm will be under the management of a director, and will be equipped with machinery, implements, horses, etc., which will be let out on hire to settlers requiring them. Selected applicants will, if necessary, receive preliminary training by working on the central farm under the supervision of the director, and be paid wages until such time as they are considered capable of working a holding independently. They will then be allotted, at a reasonable rental, land near their cottages which, if of less extent than the average-sized holding above indicated, may be afterwards increased by taking land from the central farm. Co-operative methods will be adopted for the purchase of requirements and the consignment and disposal of produce. This is, we believe, the first experiment of its kind in this country, and its development will be watched with great interest. For some years there has been a great controversy as to the merits of schemes of this kind, and now arises the opportunity for the large-scale test. The experience gained is likely to be of great value, deciding whether or not such colonies can be run on an economic basis.

PROF. A. S. DONNER, director of the observatory at Helsingfors, has presented to the University, of which he was formerly rector, the sum of 8000*l*., to ensure the continuance, and indeed the completion, of the "Catalogue photographique du Ciel, Zone de Helsingfors," begun under his direction in 1890. Hitherto the work has been paid for, partly by the University, partly by Prof. Donner out of his private means. The sum now allotted by him is intended to cover all expenses for twelve years, when, at its present rate of progress, the task should be finished.

THE Sociedad Argentina de Ciencias Naturales, Buenos Aires, has elected as corresponding members Sir Ernest Shackleton and Mr. W. H. Hudson, author of "Argentine Ornithology" and other works. Mr. Hudson is an Argentine by birth.

THE opening meeting of the Institution of Electrical Engineers for the session 1916–17 will be held on Thursday, November 9, when the eighth Kelvin lecture will be delivered by Dr. Alexander Russell, who will take as his subject "Some Aspects of Lord Kelvin's Life and Work."

The address of the retiring president, Sir Joseph Larmor, at the anniversary meeting of the London Mathematical Society, to be held on Thursday, November 2, at 5.30, at Burlington House, will deal mainly with "The Fourier Harmonic Analysis: its Practical Scope and its Limitations."

The Cardiff Naturalists' Society, the most influential body of its kind in Wales, attains its jubilee next year. It is hoped to signalise the event in a useful way by producing a complete fauna of Glamorgan.

A singular phenomenon excited extraordinary attention at and round Cardiff on the evening of October 16. About 6.25 a narrow bar of light appeared in the north-north-west, about 6° long and 1° broad, some 40° above the horizon, the sky being mostly overcast at the time. By 6.35 it had shifted to the north, and ten minutes later to its former situation, whilst a similar appearance was seen in the north-east, a good deal fainter than the other. The beam just mentioned was of an angry ruddy colour, and fitfully illuminated the surrounding haze. Along the northern horizon all this time there was a glow, probably of auroral origin, and the Rev. John Griffith informs the writer that the shaft of light was, in his opinion, possibly auroral also, he having witnessed a similar phenomenon some years ago.

We notice with regret the announcement of the death on September 14, in his sixty-first year, of Prof. Josiah Royce, distinguished for his contributions to philosophy, logic, ethics, and psychology, and professor of the history of philosophy at Harvard University from 1892 until his recent retirement.

The death is announced, in his fifty-third year, of Dr. J. H. Kastle, research professor of chemistry since 1911 at the agricultural experiment station in connection with the State University of Kentucky. He had previously been chief of the division of chemistry in the hygienic laboratory of the U.S. Health and Marine Service from 1905 to 1909, and professor of chemistry at the University of Virginia from 1909 to 1911. He was the author of treatises on the chemistry of metals and the chemistry of milk, as well as of articles in the *American Chemical Journal.*

At a hearing before a New York official budget committee it was recently stated that the attendance at the American Museum of Natural History for the year ending June 30, 1916, was 870,000, as against 664,215 for the previous year. The increase was attributed to the larger number of visits to the museum by classes from the schools. During the same period the attendances at the Metropolitan Museum of Art, the New York Zoological Garden, and the Aquarium have considerably decreased.

The death is announced of Dr. David Maron, a research chemist, whose work is referred to as follows in the *Times* of October 20:—"Dr. Maron was a Russian, aged fifty-two, who had been resident in England for many years. He claimed to have invented a new process by which the output of high-explosive shells could be accelerated, and he carried on his operations at a factory near London. On September 14 there was a serious explosion at the works. The Press Bureau announced that 'an explosion has occurred to-day at a factory where the manufacture of explosives on a small scale for the Government had recently been commenced. The casualties are not numerous, present reports recording five killed and fifteen injured.' Dr. Maron was seriously injured, and he died on September 17."

In addition to the awards announced in April for papers read at the meetings, the council of the Institution of Civil Engineers has made the following awards for papers published in the Proceedings without discussion during the session 1915–16:—Telford premiums to Messrs. Hubert Mawson (Liverpool), T. W. Keele (Sydney), R. W. Holmes (Wellington, N.Z.), W. Fairley (London), J. M. Greathead (Johannesburg), T. C. Hood (Manmad, India), and J. B. Ball (London); the Manby premium to Mr. W. C. Cushing (Pittsburg, U.S.A.); and the Crampton prize to Major C. E. P. Sankey (London). The Indian premium for 1916 has been awarded to Sir John Benton (Eastbourne).

The President of the Board of Trade has appointed a committee to consider the position after the war, especially in relation to international competition, of the lead, copper, tin, and such other of the non-ferrous metal trades as may be referred to the committee, and to report what measures, if any, are necessary or desirable in order to safeguard that position. The members of the committee are:—Sir Gerard Albert Muntz, Bt. (chairman), Mr. C. L. Budd, Mr. C. Cookson, Mr. C. W. Fielding, Lieut.-Col. A. J. Foster, Mr. A. W. Tait, and Mr. A. H. Wiggin. The secretary is Mr. J. F. Ronca, to whom all communications relating to the committee should be addressed at 7 Whitehall Gardens, S.W.

At the statutory meeting of the Royal Society of Edinburgh, held on October 23, the following office-bearers and council were elected:—*President,* Dr. J. Horne; *Vice-Presidents,* Dr. B. N. Peach, Sir E. A. Schäfer, the Right Hon. Sir J. H. A. Macdonald, Prof. R. A. Sampson, Prof. D'Arcy Thompson, Prof. J. Walker; *General Secretary,* Dr. C. G. Knott; *Secretaries to Ordinary Meetings,* Prof. A. Robinson, Prof. E. T. Whittaker; *Treasurer,* Mr. J. Currie; *Curator of Library and Museum,* Dr. A. Crichton Mitchell; *Councillors,* Dr. W. B. Blaikie, Principal O. C. Bradley, Dr. R. S. MacDougall, Dr. W. A. Tait, Dr. J. H. Ashworth, Prof. C. G. Barkla, Prof. C. R. Marshall, Dr. J. S. Black, Sir G. A. Berry, Dr. J. S. Flett, Prof. M. Maclean, and Prof. D. Waterston.

Typhoid inoculation was the subject of a question by Mr. Chancellor, the member for Haggerston, in the House of Commons on October 18. Mr. Forster, replying, said that up to August 25, 1916, of the total cases finally diagnosed as typhoid fever amongst the British troops in France, 903 were amongst inoculated men and 508 amongst uninoculated men. There were 166 deaths, 47 of which were amongst the inoculated and 119 amongst uninoculated. To the same date there were 2118 cases of paratyphoid fever, 1968 amongst inoculated men, and 150 amongst men who had not been inoculated. There were 29 deaths, 22 of which were amongst the inoculated and 7 amongst the uninoculated. From these figures it will be seen that the case-mortality per cent. for typhoid fever is, among the inoculated 5·0, and among the uninoculated 23·4; for paratyphoid, among the inoculated 1·12, and among the uninoculated 4·66—a striking testimony in favour of inoculation.

The exhibition of kinematograph films of Capt. R. F. Scott's Antarctic expedition has been revived after an interval of nearly two years, and is being shown twice daily at the Philharmonic Hall by Mr. H. G. Ponting. Mr. Ponting, during the year he spent with the expedition, availed himself of every opportunity of making kinematograph records of the life and work in the Antarctic, and has a remarkable series of pictures to show. The pictures of Weddell seals and Adelie penguins are excellent records of Antarctic animal life, but cannot compare in the skill and patience required with the film of penguin chicks breaking out of their eggs or of skua gulls swooping down on a penguin rookery and stealing unguarded eggs. The film showing the bows of the *Terra Nova* breaking into the pack gives a good idea of how a polar ship forces her way among ice. The films of sledging and camping show Capt. Scott and his four companions in the first few days of their southward march. These have an interest that can never fade in any field of heroism. Mr. Ponting was happily inspired in reopening his exhibition at the present time, not only for the high educational value of the pictures themselves, but in recalling the devotion and self-sacrifice that men may show in peaceful endeavour.

We learn from *Symons's Meteorological Magazine* that Mr. Edward Mawley died on September 15, at seventy-four years of age. The following particulars of his work in meteorology are from an obituary notice in our contemporary:—Mr. Mawley was elected a fellow of the Royal Meteorological Society in 1876, and served continuously on the council from 1881 to 1908. He was president in 1896–98, when he gave two addresses of great value. The first was on "Shade Temperature," giving the results of a lengthy series of experiments with different patterns of thermometer screen, which resulted in the adoption of the Royal Meteorological Society's modification of the Stevenson screen. The second was on "Weather Influence on Farm and Garden Crops," and may be said to have intertwined the two main branches of his life-work. After retiring from the presidency he acted as secretary at the meetings of the society from 1898 to 1901, and throughout the whole time his influence was always exercised in extending the usefulness of the society and increasing its dignity. Mr. Mawley commenced his meteorological observations at Richmond, Surrey, in 1870, and in 1873 he went to Addiscombe, near Croydon, where his meteorological observations were greatly extended. In 1883 he moved to Berkhamsted, where he soon created one of the finest private meteorological stations in the country.

The meeting of the Gilbert Club, to which we referred in our issue of October 12, was held in the rooms of the Royal Society of Arts on Wednesday of last week. The Right Hon. Lord Moulton occupied the chair. Mr. Conrad Cooke, the hon. secretary, read his report recording the past history and present position of the club, and in it he paid a warm tribute to the memory of Prof. Silvanus Thompson, expressing the irreparable loss to the club, of which he was the life and soul, by his lamented death. Mr. Charles Benham, of Colchester, as representing the hon. treasurer, read the hon. treasurer's report. Both these reports were adopted. The members then devoted themselves to a discussion as to the disposal of the property of the club, including thirty-four copies of the translation of Gilbert's "De Magnete," issued by the Gilbert Club, and letters were read from Lord Rayleigh, Sir Joseph Larmor, Dr. Singer, of Oxford, Mr. W. M. Mordey, Mr. James Paxman, and others, in which various suggestions were made, and a general discussion followed. The general consensus of opinion, however, appeared to be that the proceeds should be devoted to forming the nucleus of a fund to establish a Gilbert scholarship for physical science in the Royal Grammar School at Colchester, in which in all probability William Gilbert was himself a scholar. Lord Moulton, in summing up the discussion, pointed out the legal aspect of the question, giving it as his opinion that the meeting was not competent to dispose of the property of the club outside its original constitution without giving notice to the members beforehand of the suggestion to be proposed. He considered it advisable that the meeting should be adjourned for three months in order that this should be done. Lord Moulton's recommendation was unanimously adopted.

In the October issue of *Man* Mr. St. George Gray describes a remarkable chipped flint implement found in British Honduras. It is 19¾ in. in length, chipped throughout, with a straight, chopper-like edge on one side, and on the other two tapering projections. In general character it resembles other large and occasionally serrated implements found in Honduras and now in European museums. No suggestion is made about the possible use of such an implement; but the theory may be hazarded that it bears some ritualistic significance, and that it may have been used in sacrifice or for some similar religious purpose.

Dr. A. C. Haddon contributes to the October issue of *Man* a useful article on "Kava Drinking in New Guinea," based partly on published materials and partly on information collected for the first time from friends who have visited the island. The question is important, because Kava drinking has been regarded as a criterion of a certain definite migration, or series of migrations, into Oceania. The root of the pepper plant (*Piper methysticum*) is chewed, not only by grown-up men, who take part in the feast, but also by boys, to whom the drink is still forbidden, and who, together with the women, are not allowed access to the feasting assembly. It is then filtered through grass in a coconut shell, and a traveller who drank it found that it possessed powerful intoxicating properties. It was apparently used to produce mental excitement during some form of tribal ritual. In British New Guinea the custom prevails among three cultures: those of the Kabiri, Mawata, and Maringara. Dr. Haddon supposes that it might readily spread from the Kabiri to the bush peoples behind the Fly delta, but we are in the dark as to the date of this possible drift. There seems to be no reason to believe that it was imported into the Fly estuary area on the south coast of Netherlands New Guinea by a migration or cultural drift by sea. His own opinion is that it has come overland, possibly from Astrolabe Bay. This must, however, remain doubtful until we know more of the races in the interior of New Guinea.

The psychology of the organised group game is the subject of the fourth Monograph Supplement to the *British Journal of Psychology*. The author, M. J. Reaney, in her introduction, considers the problem of play in general, and summarises the various theories, both physiological and biological, which have been put forward to account for the phenomena of play. She then reviews the types of play leading up to the organised group game, which occupies such a prominent position in the life of modern England. The relation between the type of game played and the degree of racial development is brought out, showing that the organised group game appears only in races which have reached a stage of development in which co-operation is combined with division of labour and loyalty to a leader. She suggests, too, that this form of play gives an outlet to instinctive tendencies for which civilised life affords little scope. In an investigation worked on the principle of correlation she found a direct correspondence between general ability and success at games. The paper will be of particular interest at the present time, when the place of games in education is so much discussed, and when the English habit of "playing the game" is showing its value. Apart from the scientific value, antiquarians and historians will find much that is interesting.

DR. HAMLYN-HARRIS and Mr. Frank Smith contribute some valuable notes to the Memoirs of the Queensland Museum, vol. v., on "Fish Poisoning and Poisons Employed among the Aborigines of Queensland." Considering the widespread practice of fish poisoning, the authors hold that it is not unjustifiable to assume an independent origin among the Australian aborigines, and the evolution of an empirical knowledge of efficient piscicides. Having regard to the very considerable number of plants used for this purpose, the varied properties of the poisons obtained from them, and the skill and knowledge displayed in their preparation, the intelligence and reasoning powers of the preparers would seem to be of a higher standard than that generally attributed to them.

THE Rev. S. Graham Birks contributes a lengthy paper on Megalichthys to the Transactions of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, vol. iv., part 2. The fossils described belong in part to the Hancock Museum, Newcastle-upon-Tyne, and in part to the Manchester Museum, some of which have not been previously described. The result of this investigation, it is contended, seems to show that the position of Megalichthys in the family Osteolepidæ is by no means secure. There are, indeed, indications that the classification of the Rhipidistia is in an unsatisfactory state. According to the author, although Megalichthys is not itself the ancestral type of the Stegocephalian Amphibia, there can be little doubt that the study of this genus leads inevitably towards the conclusion that its affinities are with the ancestral type, and that the Stegocephalia were evolved from a similar fish, and probably from a nearly related form. A number of very beautiful photographs add much to the value of this work.

MESSRS. HERON-ALLEN AND EARLAND have issued a report (Trans. Linn. Soc., London, Zool., vol. xi., part 13, 1916), illustrated with five excellent plates, on the Foraminifera collected during the cruise of Prof. Herdman's steam-yacht *Runa* off the west of Scotland in 1913. The material examined consisted of shore-sand and dredgings from comparatively shallow waters—sixty fathoms being the greatest depth. A list is given of the twenty-five stations at which the material was obtained, the more noteworthy species from each being indicated, and following this is a systematic account of the 324 species and varieties identified in the gatherings. A new species, *Halophragmium runianum,* and a new variety of *Lagena pulchella* are described; twenty-seven species are recorded for the first time from British waters, and a considerable number make their appearance for the second time only in a British list. The richest material was a lump of mud of about 3½ lb. weight, dredged from twelve fathoms in Loch Sunart, which yielded 203 species and varieties of Foraminifera. The memoir forms an important contribution to our knowledge of the Foraminifera of the British area.

THE report on the survey operations in New Zealand for the year 1915–16 has been received. Despite the difficulties it had to contend with in shortage of surveyors and of funds, the department records that the acreage of the settlement survey is considerably in excess of the previous year, while the cost per acre has been decreased. On the other hand, little triangulation was done, and shortage of paper seems to have delayed the publication of several maps. A feature of the report is the inclusion of a map of Anzac and the Suvla Bay area on a scale of one inch to a mile, with the heights and trenches shown. Some notes on the operations accompany the map. It is fitting that the Survey Department should make this record of the gallant endeavours of the New Zealanders and Australians in Gallipoli.

IN connection with the navigability of Hudson Bay and its value as an outlet for Canadian grain, a useful list of arrivals and departures of ships at and from Moose Factory has been compiled by Mr. J. B. Tyrrell (Papers and Records of the Ontario Historical Society, vol. xiv.). The record shows that from 1751 to 1880 not a single year passed without at least one ship arriving at Moose Factory, generally in August or September, but occasionally in July or October. The ships left again in August or September. Furthermore, Mr. Tyrrell points out that for eighty years previous to 1751, and for thirty-five years after 1880, ships sailed from Britain to Moose Factory bringing supplies, and returned with furs. When it is remembered that these ships were generally old sailing vessels, and that as a rule no attempt was made to send more than the one ship a year, the record is evidence that Hudson Strait and Bay could easily be navigated by steamers for some three months at least every summer.

Two papers by Dr. L. V. King on the "Linear Hot Wire Anemometer" have been reprinted from the Journal of the Franklin Institute, January, 1916. In these papers the mathematical theory of the instrument and the uses to which it may be put are discussed by the author. The instrument consists essentially of a fine platinum wire carrying an electric current. The temperature of the wire depends on its resistance and the strength of the current, and also on the rate at which it is cooling, since the wire, being very fine, has little capacity for heat, and the energy supplied by the current must just balance the loss by radiation and convection. The loss by convection is naturally dependent on the velocity of the air current in which the wire is placed, and it is claimed that by suitable measurements of the current and the resistance the velocity of the air to which the wire is exposed can be measured with an accuracy of less than 1 per cent. There are obviously many cases where such an instrument can be usefully employed, notably in mapping out the stream lines in two-dimensional motion, where the wire can be placed perpendicularly to the plane of motion. Wires of about 1/400 in. diameter are used, so that very little interference with the flow of air is caused.

MR. MURRAY's new list of announcements includes the following forthcoming books of science in addition to those to which attention has been directed already in our columns:—"The War and the Nation: a Study in Constructive Politics," by W. C. D. Whetham—the book will deal with such topics as land, coal and railways, science and industry, and with those fundamental racial problems made acute by the great loss of life caused by the present war; "Volcanic Studies in Many Lands," by the late Dr. Tempest Anderson, second series—the volume is intended as a memorial to the author by the Yorkshire Philosophical Society, and will contain the results of further visits to the Lipari Islands, Vesuvius (after the outburst in 1906), and to Etna, together with photographs taken after the great eruptions of the Soufrière and Mont Pelée; "Horses," by R. Pocock, with a preface by Prof. J. Cossar Ewart; and "British Agriculture: The Nation's Opportunity, being the Minority Report of the Departmental Committee on the Employment of

Sailors and Soldiers on the Land, together with some Considerations by a Free Trader in Favour of the Policy therein Advocated."

THE following volumes are in preparation for appearance in the "University of Michigan Studies" (*New York: The Macmillan Company*):—Contributions to the History of Science, part ii., "The Prodromus of Nicholas Steno's Latin Dissertation on a Solid Body Enclosed by Natural Process within a Solid," translated into English by Prof. J. G. Winter, with a foreword by Prof. W. H. Hobbs, illustrated; part iii., "Vesuvius in Antiquity," passages of ancient authors, with a translation and elucidations, by F. W. Kelsey, illustrated; Scientific Series, vol. ii., "Studies on Divergent Series and Summability," by Prof. W. B. Ford.

OUR ASTRONOMICAL COLUMN.

Two Large Fireballs.—On October 20 at 8h. 14m. and 10h. 34m. p.m. large fireballs were observed. The first was seen by Mr. J. E. Clark, of Purley, Surrey, and it was estimated as twice as bright as Venus. The path was 82°+62° to 79°+35°, and its duration four to five seconds. The second was seen by Mrs. Fiammetta Wilson at Totteridge, Herts, and by Mr. Denning at Bristol. It appeared as a ball of fire streaming slowly along in a level course about 8° above the northern horizon. This fireball was at a great distance from the observers, and probably over the southern region of Scotland. It probably emanated, like Mr. Clark's fireball, seen earlier on the same night, from a radiant near Zeta Herculis low in the N.W. sky.

Encke's Comet.—Further particulars of Dr. Max Wolf's recent observation of Encke's comet are given in *Astronomische Nachrichten,* No. 4861. The search for the comet was undertaken at the instigation of Dr. Kritzinger, and eight plates were taken at different times during August and September, with exposures amounting altogether to about thirteen hours. The last two exposures were made on September 22, in a very clear sky, and though the plates were on the point of being regarded as failures, the use of lower magnifying power easily revealed the comet, at a point about 20′ from the position given by the ephemeris. The comet appeared on both plates as a faint nebulous patch, with an extremely small condensation, and the displacement of the images in the interval between the exposures corresponded precisely with the ephemeris. The photographs were taken with the 71-cm. reflector, which was guided to follow the probable motion of the comet. The observation is of special interest from the fact that the comet was not far from the aphelion point of its orbit.

Internal Motion in Spiral Nebulæ.—An investigation of internal motions in the spiral nebula Messier 101 has been undertaken by A. van Maanen (Proc. Nat. Acad. Sci., vol ii., p. 386). In the first instance measures were made with the stereocomparator on two photographs taken by Ritchey in 1910 and 1915, and strong evidence of motion, even in this short interval, was obtained. Other plates, taken with the Crossley reflector of the Lick Observatory in 1899, 1908, and 1914, were afterwards included in the discussion. The resulting data depend upon measures of eighty-seven nebulous points and thirty-two comparison stars. Relatively to the mean of the comparison stars, the annual motion of translation of the nebula was found to be +0·005″ in R.A. and −0·013″ in declination. The mean rotational motion is 0·022″ left-handed, and the mean radial motion 0·007″ outward. The measures further indicate a small, but scarcely trustworthy, decrease of rotational motion with increasing distance from the centre. At the mean distance of 5′ from the centre, the rotational motion of 0·022″ corresponds to a period of about 85,000 years. If the parallax were known, and if it could be assumed that the movements were in elliptical orbits, the central mass could be calculated. A comparison with the average translation of spiral nebulæ determined by Curtis suggests a parallax of 0·005″, while a comparison of the cross-motions with the known radial velocities of some of the spiral nebulæ leads to 0·0003″. The corresponding central masses are 30,000 and 140,000,000 times that of the sun, and the corresponding orbital motions 21 and 345 km./sec. Evidence of rotation has also been found in Messier 81.

THE ASSOCIATION OF TECHNICAL INSTITUTIONS.

A LARGELY attended general meeting of the members of the Association of Technical Institutions was held on October 20-21 at the Imperial College of Technology and Science, under the presidency of Sir Alfred Keogh, K.C.B., the president of the association, with the view of discussing educational questions bearing upon the work of technical schools and colleges. The Right Hon. A. H. Dyke-Acland, the chairman of the executive of the governors of the Imperial College, extended a welcome to the members and referred to the splendid service which Sir Alfred Keogh, the rector of the college, in his capacity of director of the Army Medical Service, was rendering to the nation.

The conference was addressed in the first instance by Lord Haldane, Chancellor of the University of Bristol, who took for his subject "Education after the War, with special reference to Technical Instruction." He made clear in his address that unless technical education was based upon large ideas and was penetrated by sound knowledge it must surely fail. He deprecated most strongly the current controversies which sought to place the teaching of the humanities and natural science in unfriendly relation. Knowledge was one and indivisible. The study of fine literature and of the thought it embodies was just as needful to the complete training of the human being as the study of mathematics or of the phenomena of Nature, since the object of all true education was a wider, a more penetrating and stimulating vision. The teaching of the higher mathematics could, if taught in the right way, be made as stimulating as the classics. There was a great awakening in the nation, induced by the events of the war, to the paramount necessity for knowledge. Education and business were not really in two compartments. Rightly considered, the successful pursuit of manufacture and commerce depended for its permanence and value upon sound methods of education and the acquisition of accurate knowledge. Many apt and clear illustrations in support of this contention were adduced from the sphere of chemical, physical, and electrical science and practice. In the domain of applied science attention was directed to the fact that London was the great centre of the world's trade in furs, but that in order to make the furs marketable to the consumer we exported them to foreign countries, notably to Saxony, where alone they could be dyed and treated with suitable effect. The aloofness between the man of business and the man of science must cease, and all classes from the workers upwards, amongst whom there was splendid raw material, must receive the benefits of scientific training. We must have a higher standard of knowledge not only for managers, but for workmen also, if the position of